Long-term consistency of an asthma questionnaire

Ben Kolnaar, Henk van den Hoogen, Chris van Weel

Objectives: To study the long-term consistency in answers to questions on chronic respiratory symptoms of a standardised questionnaire and in the diagnosis of asthma established on the basis of the answers to these questions.
Methods: A comparison of data collected by means of a test and a retest after a one-year interval.
Population: 246 subjects aged 16 to 23. Main outcome measure: Cohen's kappa as measure of agreement between the answers to the first and the second questionnaire.
Results: Cohen's kappa values of the questions on symptoms ranged between 0.22 and 0.62 and was 0.50 for the asthma diagnosis. Of the 20% of the study group who had asthma on the basis of the first questionnaire, 32% did not report of one single asthma symptom in the second one.
Conclusions: In young adults aged 16 to 23, the long-term consistency in answers to questions on respiratory symptoms in a self-administered questionnaire and in the diagnosis of asthma assessed on the basis of the answers to these questions is unsatisfactory.
Eur J Gen Pract 1996; 2: 113-6.

Introduction

Over the last 10 to 20 years, epidemiological surveys have been conducted to assess the prevalence of asthma. Since underdiagnosis of asthma has been documented, [1-3] these assessments are not based on the presence of a clinical diagnosis alone. Screening methods are often applied, of which questionnaires on respiratory symptoms are used most frequently. Many efforts have been made to standardise them.[4-6] The short-term reproducibility (one to four months) of some standardised questionnaires has been found satisfactory.[7,8] However, as the diagnosis of asthma as a chronic disease reflects the persistent presence or recurrence of symptoms, it is essential that the outcome of these questionnaires is consistent over a longer period of time. To the best of our knowledge, no attempts have been made so far to assess this long-term consistency in answers to questions on chronic respiratory symptoms, or to assess the consistency in the diagnosis of asthma when established on the basis of the outcome of these questionnaires.

The aim of the present study was to assess in young adults the long-term consistency in the answers to questions on chronic respiratory symptoms and in the diagnosis of asthma established on the basis of the answers to these questions. Therefore, a standardised questionnaire was administered twice in an open population of subjects aged 16 to 23 with a one-year interval.

Methods

This study was part of a follow-up study on the relationship between respiratory morbidity in early childhood and asthma in young adulthood.[9]

Study population

The study population of the present study was composed of all those in the follow-up study population who were aged sixteen and over (hereafter referred to as young adults). The subjects of that study were recruited from the practice population of the Continuous Morbidity Registration (CMR) of the Department of General Practice of the University of Nijmegen.[10] All subjects of the practice lists of the four CMR practices who were born between the years 1967 and 1978 (n=1,441) and who were still on these practice lists at the start of the study in December 1988 were invited to participate: 926 subjects, 64% of the original birth cohorts, 484 boys and 442 girls, aged 10 to 23 at the time of the study. Before the start of the follow-up study 515 subjects of the original birth cohorts had left the practices; 492 moved with their families to another area and 23 children had died. Within the framework of the follow-up study, the group of 926 subjects was invited to (among other things) complete a questionnaire on chronic respiratory symptoms on two occasions. For those under sixteen (n=506) the parents were asked to complete the questionnaire for their child. The 420 young adults were asked to complete the questionnaire themselves, and the present study was based on this group.

Ben Kolnaar, general practitioner.
Henk van den Hoogen, statistician.
Chris van Weel, professor.
Department of General Practice/Family Medicine, University of Nijmegen, PO Box 9101, 6500 HB Nijmegen, the Netherlands.

Correspondence to: Dr Ben Kolnaar.
Submitted: November 11th, 1994; accepted in revised form: February 2nd, 1996.

Table 1. Questionnaire.

1a. Cough: do you usually - at least 5 days a week- cough (e.g. when getting up or during the day or at night)?
1b. Chronic cough: if yes, have you coughed like this for at least three consecutive months?
2a. Phlegm: do you usually - at least 5 days a week - bring up phlegm (e.g. when getting up or during the day or at night)?
2b. Chronic phlegm: if yes, have you brought up phlegm like this for at least three consecutive months?
3a. Cough and phlegm: have you had a period of cough with phlegm (more than usual) in the last 12 months?
3b. Chronic cough with phlegm: if yes, did a period last for 3 consecutive weeks or more?
4. Wheezing: have you had wheezing in your chest in the last 12 months?
5. Tightness with wheezing: have you had attacks of tightness with wheezing in your chest (attacks of asthma) in the last 12 months?
6a. Breathless: have you been breathless at least once in the last 12 months?
6b. Breathless more quickly: do you think that you get breathless more quickly than friends of your own age?
7a. Breathl./upstairs: have you been breathless going upstairs or riding a bike at a normal pace at least once in the last 12 months?
7b. Breathl./flat: if yes, have you been breathless when you walked on the flat at a normal pace at least once in the last 12 months?
8a. Rhinitis: have you often had a stuffed-up or runny nose in the last 12 months?
8b. Chronic rhinitis: if yes, did you have that for at least 3 consecutive months?

Questionnaire

The questionnaire on respiratory symptoms was based on the standardised questionnaire (children's version) of the British Medical Research Council (BMRC) and the American Thoracic Society (ATS).[4] The questions are listed in table 1. Short-term reproducibility (four weeks) and criterion-validity had been determined and found satisfactory.[8,11]

Study design

The questionnaire was administered on two occasions with a one-year interval. The first time (in the winter of 1988-1989) the questionnaire (hereafter referred to as quest '89) was sent by post. One year later (in the winter of 1989-1990) those who had responded to quest '89 were invited for spirometry within the framework of the follow-up study. Preceding the spirometric assessments the participants were asked to complete the questionnaire for the second time (quest '90), again by themselves and without interference from others. Moreover they were interviewed about the use of drugs for asthma. Information on who was under treatment for asthma during the study was derived from the CMR.

Analysis

First an analysis was made on whether those who participated on both occasions (the study group) formed a representative sample of the original birth cohorts. For that purpose the study group was compared with respect to sociodemographic features to those of the original birth cohorts who did not belong to the study group. Chi square tests were used to determine the significance of the differences.

Prevalence

The prevalence of both the respiratory symptoms and asthma was assessed in the study group, for the two questionnaires (quest '89 and '90) separately. The diagnosis of asthma was made on the basis of the following symptoms: chronic cough, chronic cough with phlegm, wheezing and tightness with wheezing. A subject was considered to

Table 2. Prevalence of symptoms according to the answers to questionnaires '89 and '90 and extent of agreement between these answers (Cohen's kappa).

Questions		1989 %	1990 %	kappa	95% CI
1a	Cough	10.6	15.5	0.32	0.20-0.44
1b	Chronic cough	4.1	5.3	0.41	0.29-0.53
2a	Phlegm	10.7	9.8	0.42	0.29-0.55
2b	Chronic phlegm	4.1	4.9	0.62	0.50-0.74
3a	Cough with phlegm	32.8	34.8	0.42	0.30-0.54
3b	Chronic cough with phlegm	7.7	6.9	0.46	0.34-0.58
4	Wheezing	15.2	18.5	0.52	0.40-0.64
5	Tightness with wheezing	4.2	8.4	0.34	0.23-0.45
6a	Breathless	26.0	33.3	0.48	0.36-0.60
6b	Breathless more quickly	9.4	14.2	0.42	0.30-0.54
7a	Breathl./upstairs	20.8	29.0	0.55	0.43-0.67
7b	Breathl./flat	1.6	5.3	0.22	0.12-0.32
8a	Rhinitis	45.1	52.1	0.37	0.25-0.49
8b	Chronic rhinitis	10.6	9.8	0.33	0.21-0.45

n=246; CI=confidence interval

Table 3. Prevalence of asthma* in 1989 and its change in 1990.

	1989	1990	
		asthma	no asthma
asthma	20	13	7
no asthma	80	11	69

n=246; kappa=0.50 (0.38-0.62); numbers are percentages.
*in case of an affirmative response to one or more of questions 1b, 3b, 4 and 5.

have asthma in case of an affirmative answer to one or more questions on these symptoms.

Long-term consistency
In order to assess the long-term consistency, the answers to quest '89 were compared with those to quest '90, for each question separately as well as for the diagnosis of asthma. A possible lack of agreement should be considered the result of a real change of symptoms and/or lack of consistency in the answers to the questions or in the questionnaire as a whole, as an instrument to assess the diagnosis of asthma in this age category.

In all comparisons Cohen's kappa was used as measure of agreement.[12] It gives an estimation of the agreement after correction for agreement by chance.

Results

Replies to the first questionnaire were received from 386 young adults, which is 92% of those invited. Of this group, 257 participated in the retest. Of these 257, 11 subjects completed one or both questionnaires unsatisfactorily. So of 246 subjects (64% of those invited for the retest) all necessary data from both questionnaires were available. Of this group, 124 were male and 122 female subjects; 126 were aged 16-17 years, 71 were 18-19 and 47 between 20-23.

Eleven subjects were under treatment for asthma, and six said that they were using drugs for it. The comparison between the study group and those of the original birth cohorts who did not belong to the study group showed that of the study group (statistically) significantly fewer subjects belonged to the higher social class and were male than of the latter group. No differences were found with respect to age.

Table 2 shows the prevalence of respiratory symptoms in '89 and in '90 and the kappa values; table 3 shows the prevalence and kappa of the diagnosis of asthma.

Prevalence
The four most frequently reported symptoms were recurring rhinitis, productive cough, unspecified breathlessness and breathlessness when going upstairs, both in quest '89 and in quest '90. The prevalence of asthma was 20% according to the first questionnaire and 24% according to the second one. Moreover, the prevalence figures of almost all respiratory symptoms were higher in quest '90. Of the young adults, 14% reported at least one asthma symptom in both questionnaires.

Long-term consistency
The values of Cohen's kappa of the questions ranged between 0.22 and 0.62. The questions on 'chronic phlegm' and 'breathless when going upstairs' had the highest kappa values, and those on 'breathless when walking on the flat' and 'cough' the lowest. The kappa of the diagnosis of asthma was 0.50. Part (32%) of those who had asthma on the basis of the first questionnaire did not report a single asthma symptom in the second one. Of those who did not have asthma according to the first questionnaire, 14% reported at least one asthma symptom in the second one.

Discussion

In these two surveys the prevalence of asthma found in young adults was 20% and 24% respectively. A comparison with other studies is difficult due to differences between the questionnaires and the questions, to differences in symptoms used for the diagnosis of asthma and to differences in the age distribution of the populations studied. The comparison between the study group and those of the original birth cohorts who did not participate in the study showed that there was a small but statistically significant selection tending towards lower social class and female sex. Since morbidity figures are higher in lower social classes,[13] the prevalence of symptoms and asthma in the second survey may be overestimated. However, in all probability this small selection has not influenced the results of the analysis of the long-term consistency.

Almost all respiratory symptoms showed a higher prevalence in 1990 than in 1989. This increase may reflect a *real* increase of the prevalence of respiratory symptoms, but may also reflect a lack of consistency of the questionnaire, due to a change of interpretation of the questions or a change in awareness of symptoms. The following factors may have contributed to a real increase of the prevalence of the symptoms:
- an epidemic of influenza in the Netherlands in the autumn of 1989;
- smoking behaviour; however, an analysis of the data showed that smoking did not play a substantial role in the prevalence increase.

Treatment for asthma may have contributed to the change of the prevalence of symptoms as well. However, this might not have played an important role in this study, as only 11 subjects were under treatment for asthma. In the second survey also the prevalence of asthma was higher than in the first. This may also reflect a real increase. However, both the low values of Cohen's kappa as measure of agreement and the finding that nearly a third of the young adults who had one or more asthma symptoms in the first survey did not report a single symptom in the second sur-

vey, point to a lack of consistency in the answers to this questionnaire in assessing the diagnosis of asthma. Asthma is a disease in which the symptoms vary in time, but it has never been reported that in a substantial number of the patients these symptoms disappear within one year.

'Breathlessness' was not included in the criteria for the asthma diagnosis. This was decided, because it appeared to be interpreted as 'being out of breath' rather than 'the unpleasant awareness of the need to breathe' (in the second survey the prevalence figures of unspecified breathlessness and breathlessness when going upstairs were 33% and 29% respectively). Furthermore, the answers to the questions on breathlessness showed insufficient consistency. Change of formulation may avoid misinterpretation. Nevertheless, (recurrent) breathlessness is a symptom of asthma and has been included in the criteria for the definition of asthma.[14, 15] Virtually all subjects who reported being breathless when walking on the flat at a normal pace also answered affirmatively to at least one of the questions on the symptoms that have been included as criteria for the diagnosis of asthma.

A major cause of the lack of long-term consistency in the diagnosis of asthma when established by means of a questionnaire on chronic respiratory symptoms, is the dependence on an assessment at one moment. The same problem can be found in the assessment by questionnaire of other diseases of which the symptoms vary in time. While most questions refer to a period of at least the preceding year, the answers probably reflect the experiences of the preceding months.

For epidemiologic studies, questionnaires remain the most convenient method of identifying persons with asthma. In this method the diagnosis of asthma is based on the reported presence of chronic respiratory symptoms. The present study, however, showed that this resulted in an unsatisfactory long-term consistency in the asthma diagnosis. To overcome this, it may be recommended to use more objective methods, e.g. the measurement of airways obstruction and bronchial hyperresponsiveness, both generally accepted as hallmarks of asthma.[14, 15] ■

Acknowledgements

The work reported in this paper was supported by grant nr. 900-715-163 of the Council of Medical Research of the Netherlands Organisation for Scientific Research. We are indebted to the participants in this study and their parents for their co-operation, and the general practitioners and practice assistants of the CMR practices for their assistance.
We are very grateful to W Tiersma for his computer assistance and to J Lummen for his linguistic comments.

References

1 Speight ANP, Lee DA, Hey EN. Underdiagnosis and undertreatment of asthma in childhood. *Br Med J* 1983; 286:1255-8.
2 Banerjee DK, Lee GS, Malik SK, Daly S. Underdiagnosis of asthma in the elderly. *Br J Dis Chest* 1987; 81: 23-9.
3 Kolnaar BGM, Beissel E, Bosch WJHM van den, Folgering H, Hoogen HJM van den, Weel C van. Asthma in adolescents and young adults: screening outcome versus diagnosis in general practice. *Fam Pract* 1994; 11: 133-40.
4 Ferris BG. Epidemiology standardization project. II Recommended respiratory disease questionnaires for use with adults and children in epidemiologic research. *Am Rev Respir Dis* 1978; 118 (Suppl): 7-53.
5 Florey C du V, Leeder SR. Methods for cohort studies of chronic airflow limitation. Copenhagen: WHO Regional Publications, European series no. 12, 1982.
6 Burney PGJ, Chinn S, Britton JR, Tattersfield AE, Papacosta AO. What symptoms predict the bronchial response to histamine? Evaluation in a community survey of the bronchial symptoms questionnaire (1984) of the International Union Against Tuberculosis and Lung Disease. *Int J Epidemiol* 1989; 18: 165-73.
7 Burney PGJ, Laitinen LA, Perdrizet S, et al. Validity and repeatability of the IUATLD (1984) Bronchial Symptoms Questionnaire: an international comparison. *Eur Respir J* 1989; 2: 940-5.
8 Brunekreef B, Groot B, Rijcken B, Hoek G, Steenbekkers A, De Boer A. Reproducibility of childhood respiratory symptom questions. *Eur Respir J* 1992; 5: 930-5.
9 Kolnaar BGM, Lier A van, Bosch WJHM van den, et al. Asthma in adolescents: its relation to early childhood respiratory morbidity. *Br J Gen Pract* 1994; 44: 73-8.
10 Weel C van, Bosch WJHM van den, Hoogen HJM van den, Smits AJA. Development of respiratory illness in childhood - a longitudinal study in general practice. *J R Coll Gen Pract* 1987; 37: 404-8.
11 Verkerk PH, Rijcken B. Evaluatie van een vragenlijst naar respiratoire symptomen en de maatschappelijke gevolgen hiervan in een open populatie. (abstract in English). *T Soc Gezondheidsz* 1988; 66: 102-5 .
12 Fleiss JL. Statistical methods for rates and proportions. New York: John Wiley,1981.
13 Morris JN. Social inequality undiminished. *Lancet* 1979; i: 87-90.
14 American Thoracic Society. Standards for diagnosis and care of patients with chronic obstructive pulmonary disease (COPD) and asthma. *Am Rev Respir Dis* 1987; 136: 225-43.
15 International consensus report on diagnosis and treatment of asthma. *Eur Respir J* 1992; 5: 601-41.